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Living and Dead Osteomas of the Nasal and its Accessory Cavities

Illustrated by a Case of Encysted Orbital Osteoma Originating in the Ethmoid Bone.

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LIVING AND DEAD OSTEOMAS OF THE NASAL AND ITS ACCESSORY CAVITIES.

ILLUSTRATED BY A CASE OF ENCYSTED ORBITAL OSTEOMA ORIGINATING IN THE ETHMOID BONE.

Spencer Watson called attention in 1868,[1] to the fact that a peculiar form of exostosis not infrequently developed from the walls of the ethmoidal cells and the sinuses of the frontal and ethmoid bones. Frequently these osseous tumors developed into the orbit and encroached upon the eye, displacing and finally destroying it by pressure. It was the practical importance of the latter fact that directed especial attention to the so-called orbital osteomas. Cruveilhier had before this shown that osseous tumors were often encysted or surrounded by a peripheral layer of bone. Virchow pointed out that orbital osteomas often developed in the diploë of the surrounding bones expanding their cortical substance so as to be "encysted," by a layer of the latter, but at the same time he made the distinction between these enostoses and true exostoses originating in the periosteum of the walls of the orbit.

Arnold first called attention to the fact that orbital osteomas often had their primary seat in the surrounding sinuses, and from here later in their growth entered the orbit. The true relation of the encysted osteomas of the orbit, of Cruveilhier, to the nose and accessory cavities, was not

[1] Transactions of the Pathological Society of London, 1868, page 314.

thoroughly revealed until 1881, when Bornhaupt,[2] in an excellent article describing an orbital osteoma originated in the frontal sinus and operated upon by Volkmann in Halle, gathered from the literature not less than fifty cases of these tumors. From Bornhaupt's exhaustive investigations on this subject, the most important points regarding the development, as well as the diagnosis, prognosis and treatment, hitherto unknown, have been brought forth; and we owe to him our present somewhat thorough knowledge of the subject, together with most valuable practical suggestions as to the rational method of operating for their removal.

Tillmans[3] has lately called attention to the fact that similar osteomas develop also from the walls of the nasal cavity, and that the dead osteomas described by Dolbeau, lying loose in the frontal sinus, belong to the same class of osseous tumors.

My attention has been especially directed to this subject by the following case:

Morits Mayer, 24 years of age, tailor, was admitted to Cook County Hospital, April 27, 1887. He gives the following history: Parents lived to old age and there is no history of tumors or deformities in any of his ancestors or relatives. Patient had measles when a child, but otherwise has always been strong and healthy. He dates his present illness from 1878, when he was struck by a club at the inner canthus of the right eye, causing fracture of the bones of the nose. In the course of a year a swelling appeared and increased slowly and without pain in the above named region, causing the right eye to be pushed outward.

[2] Langenbeck, Archiv für klinische Chirurgie, 1881. B. 26, p. 589. Ein Fall von linksseitigem Stirnhöhlen-Osteom, nebst Bemerkungen über die in den Nebenhöhlen der Nasen, sich entwickelnden Osteome.

[3] Ibid. B. 32, Heft 3, page 677. Ueber todte Osteome der Nasen und Stirnhöhlen.

He thinks the swelling has remained stationary for the last eight years. Five years ago a discharge of pus from the right nostril commenced and has continued ever since. Four months ago an abscess formed in the inner canthus. It was opened and left two fistulous openings which discharge a moderate amount of pus.

Present condition.— The patient is well nourished, somewhat pale, but otherwise looks healthy.

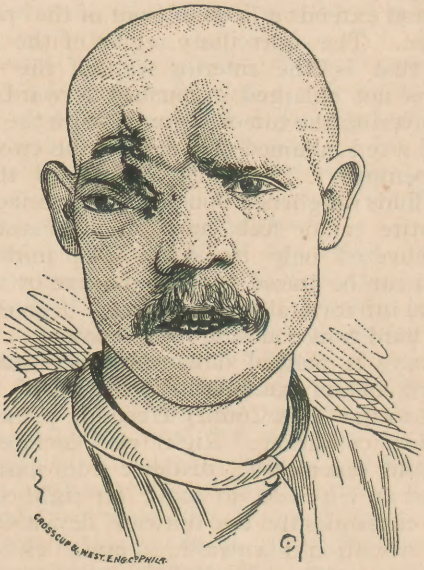
On the right side of the root of the nose is a flat prominence which fills up its inner third from the superciliary arch down to the infra-orbital ridge and extends a little in front of the bridge of the nose. The superciliary region of the frontal bone, that is, the anterior wall of the frontal sinus is not enlarged or pushed forward. The skin covering the tumor is normal with the exception of a red inflamed area around the two fistulous openings. The probe introduced through these, finds roughened bone near the surface, and the entire tumor feels hard, as if consisting of bone covered only by skin, The infraorbital margin can be traced to within a line or two inside the infraorbital foramen, where it gives place to the hard tumor arising from below.

The eye is pushed downward and somewhat outward, and on examination by Dr. E. M. Smith, oculist to the Cook County Hospital, presents the following condition: Right eye deviated outward and downward; distance from nasal crest to pupil on left side, 30 mm.; on right side, 50 mm.; consequently the outward deviation is 20 mm.; deviation downward, 10 mm.; exophthalmos, 7 mm. There is slight hypermetropia, the pupil is active, the tension of the eyeball normal. Ophthalmoscopic examination shows the fundus normal, the optic papilla not swollen, but the

veins are somewhat engorged and tortuous. Acuteness of vision good.

Inspection of nose shows, an inch and a half inside the nostril, instead of the inferior and superior meatus and the concha, an irregular mass covered with bluish-red mucous membrane, and to which several small polypi the size of a pea are attached.

The infraorbital region is somewhat prominent in its nasal half, but no distinct tumor can be felt behind the upper lip above the alveolar process of the upper maxilla.



Ethmoidal Osteoma.

Inspection of the mouth and palate shows no difference between the two sides, and the soft palate and pharynx are normal. Rhinoscopic exam-

ination is impossible on account of the thickness and size of the soft palate, the movements of which the patient cannot control. Palpation of the nasopharyngeal cavity with the finger reveals a hard, irregular, rough, bony mass filling up the right posterior coana. A small exploratory incision dilating the fistulous opening of the tumor, in the inner canthus, showed the roughened bony surface of a large osseous tumor which was hard and immovable.

Diagnosis.—Orbital osteoma originating in and being part of a large ethmoidal osteoma. The place of origin either in the lower medial point of the frontal sinus or in one of the ethmoidal cells.

Operation.—On May 3, 1887, the patient was anæsthetized and an attempt made to introduce a Bellock's tube with a view of tamponing the right cavity of the nose posteriorly and anteriorly, so as to avoid hæmorrhage down into the pharynx. This was frustrated by the tumor in the nose which made the introduction of the tube impossible. The patient was then placed on his back, with his head hanging downward, to be operated upon in Rose's position. A longitudinal incision was made midway between the eye and the root of the nose, commencing on the frontal bone an inch above the orbit and extending downward three inches to the ala of the nose. The incision having been carried down to the tumor, the soft parts were detached by a gouge from the anterior and orbital surface of the latter. The tumor was found to extend far back in the orbit, from an inch to an inch and a half. The surface of the tumor is very hard and the tumor itself immovable. With a view of getting at the base of the tumor, if it existed, or rather, of uncovering the mass of the tumor, I removed with the chisel the nasal and frontal portions of the

superior maxilla and the right nasal bone, together with the nasal process of the frontal bone. Having thus opened the frontal sinus I was so fortunate as to find the end of the tumor reaching up, with only a small corner which was not attached to the walls of the frontal sinus at all. Through the large lateral opening into the nasal cavity, the tumor was found filling it up and by grasping with a firm bone forceps, it was easily made movable and brought out through the opening. The bony tumor which was formerly felt in the posterior nares was still there, but it was loose and was removed through the same opening as the other tumor. There was now left a large cavity opening into the frontal sinus and posterior nares, and the nasal and sub-maxillary cavities below. In the orbit, the periosteal covering of its inner wall was intact, covering the eye and its accessory organs. The remainder or the cavity was covered with its mucous membrane, on which several small polypi were found and removed.

There was no considerable hæmorrhage and the wound was united and the cavity washed and packed with iodoform gauze. With the exception of a slight rise in temperature on the second day, the course of the after-treatment was aseptic. The iodoform gauze dressing remained until the close of the second week, at which time the wound had united.

Description of Tumor.—The living osteoma weighs two ounces, measures 2½ inches in length and 1½ inches in diameter; it is irregular in shape, since it consists of several portions, corresponding to the different cavities which it occupied. These portions, separated by distinct depressions from the central body of the mass, are: 1. The orbital portion which forms a rather square mass of bone, measures 1½ inches from above downwards, 1½

inches in antero-posterior, and ¾ inch in transverse diameter. Its anterior ridge is denuded and roughened, while the rest of the tumor is covered with periosteum and a thick layer of mucous membrane. The orbital portion reaches from the internal anterior border of the orbit back to the orbital foramen. From the upper inner corner of the orbital portion a small round projection the size of a pea extends up into the frontal sinus. 2. The portion occupying the antrum of Highmore is a rounded pyramid ½ inch broad ¼ inch high, and occupies the cavity mentioned, the nasal wall of which has disappeared. 3. The nasal portion, which forms the bulk of the osteoma is an irregular square of the above mentioned diameter in all directions; its inner surface is covered with a thick layer of mucous membrane, from which three mucous polypi the size of a pea have grown out. At the anterior upper corner of this nasal portion is a large polypous growth ½ inch long, ¼ inch broad, pedunculated. It contains a small bony nucleus the size of a pea; in other words forms a small osteoma, by means of a pedicle movable against the large tumor, in which there is a small depression into which it partially fits. The posterior inferior surface of the nasal portion is concave, 1 inch in diameter, covered with a thick layer of smooth connective tissue. The concave surface forms a cup into which the upper rounded surface of the dead osteoma, so to speak, articulates. On the middle of the inner surface of the nasal portion is found a square plate of the ethmoid bone ½ inch in diameter, which I consider the point of origin of the osteoma.

The cut surface of this large osteoma shows a peripheral layer ¼ inch in thickness, of extremely hard, compact osseous substance; so hard that a sharp chisel or knife will only with difficulty cut

into it, and a smaller central area of cancellous substance, which is so friable as to be penetrated with considerable ease with sharp instruments.

Microscopic examination of the layer of soft tissue covering the tumor shows the following: A layer of cylindrical epithelium, under which is a heavy layer of mucous membrane proper containing numerous tubular mucous glands. Finally, nearest to the bone, a layer of fibrous tissue constituting the periosteum.

The dead osteoma is about 1½ inches long, ¾ to 1 inch in diameter. Its upper surface, which has articulated in the above described cavity in the large tumor is rounded, slightly nodular, smooth and hard, like ivory. The rest of the surface is uneven and roughened. Parts of the tumor had been broken off, so that when the whole tumor was put together it would form a large mass of the size of a walnut. The broken surface shows this to consist of a very thin outer shell of very hard compact bone substance, and within a mass of fine spongy substance, resembling pumice stone.

On the dead osteoma there is nowhere a trace of any membrane covering it and it emits a penetrating fetid odor. No odor at all emanates from the living osteoma.

Etiology and Mode of Origin.—Bornhaupt has found in the literature 23 cases of osteomas in the frontal sinuses, 12 cases of osteomas in the ethmoidal cells, 10 cases of osteomas in the antrum of Highmore, and 5 cases of osteomas in the sphenoidal cavity or sinus. In all 59 cases of encapsulated orbital osteomas. These seem to be more common than the orbital exostoses, of which the literature furnished him only 7 cases. This class of tumor is more prevalent in youth, 54 per cent. occurring before the age of puberty, 87 per

cent. before the 30th year; that is, before the final or finished development of the accessory cavities of the nose. It is thus likely that they owe their origin to some disturbance in the development of these cavities.

1. Orbital portion of the living ethmoidal osteoma.
2. Nasal portion of the living ethmoidal osteoma.
3. Lamina of ethmoid bone from which the living osteoma originated.
4. Dead nasal osteoma.
5. Cavity in ethmoidal osteoma in which the nasal osteoma articulates.

A traumatic cause has been noted in 6 of Born-

haupt's and in the present case. Considering the general frequency of traumatism in this region, it is very unlikely that it plays any part in the etiology of these tumors.

Whether the tumors originate in aberrating islands of cartilage of the primordial cranium or in an embryonal matrix of the periosteum of the membranous cranium, is as yet an open question. The chief argument against the origin from cartilage is, that no partly cartilaginous osteoma has ever been found in or around this region. It is therefore more probable that they develop from the periosteum on the walls of the cavities mentioned.

Pathological Anatomy.—The tumors consist of a mass of bone with a covering of periosteum and mucous membrane.

a.—The osseous mass of the tumor has the following characteristics: The shape of the tumor originally is round. When it enlarges and extends into the orbits or any other adjoining cavity the form becomes modified. At the place where the tumor passes through the wall or opening into the cavity, a contraction or neck forms, on the distal side of which, as if further growth was not now restricted, a roundish, more voluminous portion develops. Thus in the specimen here presented we easily recognize an orbital portion with a depression or neck separated from the larger nasal portion, and at its outer lower point of union with the former, a maxillary portion extends into the antrum of Highmore.

The surface of the osteoma is irregularly nodulated.

The tumors are extremely hard, like ivory, especially on the surface. Thus it is impossible to chisel into or cut away pieces of them. On the cut surface we find a hard peripheral layer sur-

rounding a more spongy center. Sometimes a laminated arrangement of the peripheral hard layer is found. The central spongy area has been described as resembling pumice stone. Whenever the osteomas have a pedicle or base as when they develop in the frontal sinus, as a rule the base is composed of spongy tissue. Thus the tumor can be successfully attacked at this place only. It has often happened that while the operator has been engaged unsuccessfully in chiseling at the body of the tumor it has suddenly become loosened by the breaking of the pedicle.

b.—*The Covering of the Tumor.*—All encapsulated osteomas are covered with a layer of soft tissue, namely, first, periosteum, and outside of this mucous membrane. The latter contains the usual tubular muciferous glands of the nasal mucous membrane, and is covered with cylindrical or fimbriated epithelium. This layer of mucous membrane is sometimes (as in the specimens here presented) thickened and covered with mucous polypous growths.

Invasion of neighboring cavities takes place where the osteoma has grown too large for the cavity in which it originated. The orbit is most commonly invaded as its walls participate in the formation of the ethmoidal, frontal and maxillary sinuses. The growing osteoma presses upon the bony wall of the orbit, which at the place of contact atrophies and disappears, and the osteoma with its covering of mucous membrane enters the orbit. If the tumor enters from the frontal sinus the eye is pushed downwards and outwards; if the ethmoidal sinus is the point of origin the eye-ball is dislodged outwards. Finally, if the tumor originates in the antrum of Highmore, the displacement will be in an outward and upward direction.

As soon as the orbit is opened, and in consequence, the mucous membrane covering the osteoma comes in contact with the connective tissue spaces of the orbital periosteum or the orbital connective tissue, an abscess forms. The microbes present on the surface and in the mucous glands of the mucous membrane invade the lymph spaces of the affected tissue and, necessarily, traumatic infection resulting in suppuration takes place. Thus an abscess forms near the inner canthus of the eye. In older cases we find one or more fistulous openings leading down to the surface of the orbital portion of the osteoma.

Far more serious in its consequences is the invasion of the cranial cavity by osteomas developed in the frontal or sphenoidal sinuses. The suppuration first between the dura mater and the cranium, later on perforating the dura mater, terminates the patient's life by suppurative leptomeningitis, or abscess of the brain.

Bornhaupt found that of 17 cases of osteoma of the frontal sinuses, in 11 cases, or 65 per cent., opening into the cranial cavity had taken place.

Symptoms.—In the beginning the symptoms are not characteristic as the osteomas grow very slowly, are painless and cause no inflammation as long as they stay in the cavity in which they originate. Enlargement of the wall of the cavity is often found, and next we find a hard, painless tumor in the inner canthus of the eye.

Displacement of the eye-ball is often the first symptom that calls attention to the existence of a tumor.

By filling up the sinus in which it develops and occluding its outlet accumulation of mucous or catarrhal fluid takes place, with subsequent distension followed by the symptoms characteristic

of this condition. Finally the abscess forms under the conditions described above.

Diagnosis.—An extremely hard, painless tumor of slow growth, at the inner wall of the orbit, accompanied by abscess and fistulous openings resulting therefrom, makes the diagnosis of encysted osteoma reasonably easy. A very important point to ascertain now is the place of origin of the tumor. As above stated, the deviation of the eye-ball gives us the most important information in this direction. If the eye is pushed downward and outwards, we may expect an osteoma of the frontal sinus; if directly outward the tumor comes from the ethmoidal cells; if upwards and outwards, from the antrum of Highmore.

Prognosis.—The prognosis depends upon the seat of origin of the tumor. Osteomas of the frontal sinuses must be considered as very dangerous. The mortality after the operation has been, according to Bornhaupt, 64 per cent. Of 11 cases, 7 died from meningitis, or abscess of the brain.

Osteoma of the sphenoidal sinus has been operated upon only once by Ferguson. The patient died from collapse shortly after the operation. Other tumors of this variety have not been observed in living patients, but found on specimens in museums.

In the case of osteomas developed away from the cranial cavity the prognosis is entirely different. The ethmoidal, nasal, and supra-maxillary osteomas are not dangerous and can be removed with safety. Out of 12 cases of ethmoidal osteomas, 11 were cured by operation, 1 by spontaneous exfoliation.

Osteomas of the antrum of Highmore give also a good prognosis for extirpation for the same reason as that given for the ethmoidal tumors,

namely, the absence of injury to the cranial cavity.

Treatment.—The encysted osteomas have no connection with syphilis, and consequently are not amenable to internal medical treatment. Surgical treatment alone comes into question, that is, extirpation of the tumor. Considering the anatomy of the encysted osteomas, as above described, the plan for operating is obvious. We must expose the tumor by removal of its encysting bony walls, find its base or pedicle, and divide the latter, in order to free the tumor. The extreme hardness of the body of the tumor makes any attempt at removal piecemeal by hammer and chisel almost impossible. Knapp worked five hours on a tumor of the frontal sinus and was able to remove only a small piece. He was obliged to abandon the operation and the patient died from meningitis seven weeks later. Maissonneuve, in trying to chisel off a prominent nodule of an orbital osteoma originating in the ethmoidal cells, found such a degree of hardness that he had to work for a long time with all the different bone instruments with which Charrière, who was present, could furnish him, before he succeeded in removing even a nodule of the tumor.

If we then cannot attack the tumor from its surface, we must lay it open, expose it by removing with the chisel the bones that cover it, the anterior wall of the frontal sinus, nasal and maxillary bones. When the tumor is exposed we look for its base or pedicle. Knapp has pointed out that this part of the osteoma is often composed of soft, spongy bone tissue, so that the chisel may be used here with advantage. In operating upon ethmoidal osteomas it makes no difference whether the base is hard or soft, because the fine, thin plates of the ethmoidal bone, from which the

tumor has grown out, break off and fall out with the tumor with almost the first stroke of the hammer. The specimen here presented shows a plate of the ethmoid bone adherent to the tumor.

The removal of the osteomas from the frontal sinus is more difficult, not so much because the plates of the frontal bone are stronger than the thin ethmoidal plates, but because we dare not break off the cerebral plate of the frontal sinus for fear of meningitis. We must try to divide the pedicle with the chisel without employing much force, and rather leave part of the osteoma than open the cranial cavity (v. Oettingin and Birkett). But even if the most careful manipulation of the instruments is observed, as in Socin's operation described by Banga, in which the tumor, to the astonishment of all present, became loose by almost the first touch of the hammer, the cranial cavity may be opened with disastrous result.

This often unavoidable danger in operating in the frontal sinus induced Mackenzie and Berlin to advise enucleation of the compressed, inflamed, doomed eye, instead of the radical extirpation of the tumor. However unsatisfactory this remedy seems from a surgical standpoint, it deserves earnest consideration, inasmuch as the osteomas are benignant tumors of slow growth and may in course of time separate spontaneously from their point of origin.

Spontaneous loosening of the encapsulated osteomas takes place not infrequently. Beside the small loose or dead osteomas found accidentally in frontal sinuses, of which Tillmans reports 6 cases, we find a case described by Middlemore, who tried to remove an orbital osteoma, but gave up the operation. Nine months later the tumor became loose and was extracted. A similar case is reported by Imre, cited by Tillmans. An orbital

osteoma the size of a fist had pushed the eye down to the angle of the mouth. After 43 years duration it became loose spontaneously, and the eye returned to almost its normal place in the orbit. Hilton saw a large osteoma of the antrum of Highmore which had destroyed the eye, become loose after 17 years, during suppuration.

Tillmans reports a case in which he removed by operation two loose dead osteomas of the frontal sinuses and an osteoma of the nasal cavity. He points out that osteomas of the nasal cavity have been as yet very seldom reported. Habermaas saw a case in v. Brun's Klinik. The tumor had originated in the ethmoid bone, with a pedicle the size of a thumb. It was successfully removed by operation. He remarks that the so-called nasal stones or concrements have sometimes been found to contain a nucleus of bone. This fact makes it probable that dead osteomas of the nasal cavity are more common than has been hitherto believed.

The cause of the spontaneous loosening and death of the osteomas is as yet not satisfactorily settled. Suppuration is generally conceded to be one of the causes.